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Title: Conducting A Literature Review & Writing an Introduction

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Los Alamos NATIONAL LABORATORY

Conducting A Literature Review & Writing an Introduction

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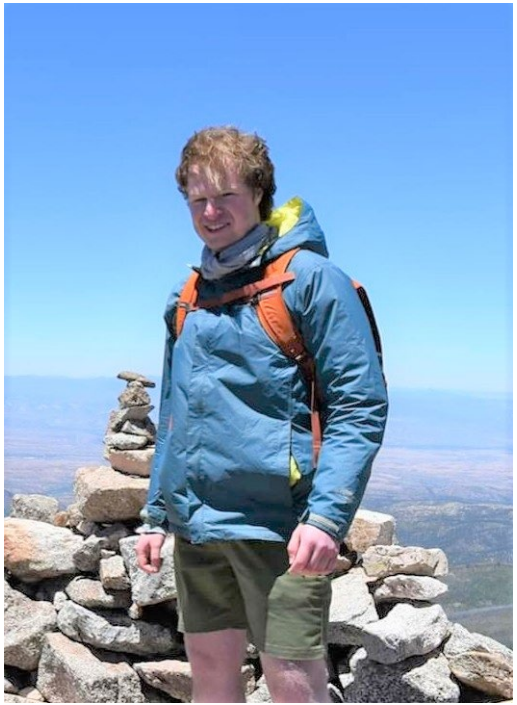
Who Am I?



Education – Michigan Technological University
BS & MS in Computer Engineering
Ph.D. in Electrical Engineering
NSF GRFP Recipient

Experience
LADSS 2015 Alumnus
MIT Lincoln Laboratory Summer Research Intern
LANL Postdoc 2020-Present
Ultrasonic NDE Research

Outline

- Introductions (The Person-to-Person Kind)
- Introductions (The Technical Paper Kind)
  - What are they supposed to accomplish?
  - Mapping a path from idea to words on paper
  - Common pitfalls & how to avoid/handle them
  - Ways to make your life easier
- Live Demo!

Survey of Experience!

What is an introduction supposed to do?

1. Introduce & motivate the problem
2. Lit Review
   - Describe the current state of the art (work by others)
   - Describe your (team's/mentors'?) previous related work
3. Set the work described in this paper apart (describe the novelty)
4. Describe the structure of the paper to come (?)
   - Honestly this one's a little take-it-or-leave-it for me
5. Notation (?)
   - Only need this if your paper get's pretty math-heavy

- Typically:
  - In this order
  - 1-2 pages total

Charting a Path from Idea to Paper

Take a reader from what they know to what you need them to know

- This requires:
  - Understanding who your audience is/what you can expect them to know
  - Understanding specifically what you need them to know
  - Pro-Tip: write as if you're explaining it to your past self just starting the project

Charting a Path from Idea to Paper

Introduce & Motivate the Problem

- Step 1: Figure out what you need them to know
  - Draft a few sentences describing the work that you're going to do (but write it in the past tense…)
  - This statement will evolve during the lit review & the research, that's normal
- Step 2: Figure out what you can expect them to be familiar with
  - Your audience for IMAC:
    - Undergrad/Grad students like yourself
    - Chuck, Pete Avitable
    - Everything in between
- Step 3: Start writing!
  - 1-2 Paragraphs
  - Start by discussing the broad topic/capability gap/pain point
    - e.g. The dynamics of big buildings are hard/expensive/critical to monitor…
  - Narrow down toward the specific technical problem
    - e.g. Video based motion magnification offers a simple measurement solution, but it introduces [difficulty] in terms of data processing…

Charting a Path from Idea to Paper

Lit Review

- Step 1: Identify relevant search terms, publications, timeframe
  - Goal is to figure out how others have tried to solve this/similar problem
- Step 2: Take those parameters to Google Scholar/[Insert Your Favorite Database]
  - Open a new tab for each article with a relevant title
  - Down-select for relevance again by reading the abstracts
  - Save the PDF & citation information (a citation manager is helpful here)
- Step 3: Read & Take Notes!
  - Start reading each paper
  - In the introduction of the paper, make a short bulleted list (2-4) for each paper you read
    - Highlight the big/important/unique features of the paper only
    - Avoid repeated/common information
    - Use your own words, plagiarism is bad
    - If you're using an automated citation generator, include the citation tag/reference now
- Step 4: Arrange the sources into coherent groups (e.g. similar approaches)
- Step 5: Condense the lists into prose
- Team's Related work section is a similar but simpler process of describing the relevant aspects of previous work

Charting a Path from Idea to Paper

Describe the Novelty of Your Work

- 1-2 Paragraphs
- Identify aspects of your work that are different/more general/more advanced than previous works (others & yours)

Summary of Paper to Come

- 1 Paragraph
- A sentence describing what each section will say
- “Section 2 describes the theoretical background of this work, including the operating principles of a Turboencabulator.”

Notation

- 1 Paragraph
- “Lowercase symbols refer to scalars, bold lowercase symbols refer to column vectors, bold uppercase symbols refer to matrices, $(\cdot)^H$ represents Hermitian transposition…”

Common Pitfalls & How to Avoid/Handle Them

- “What if I miss a relevant paper in the lit review?”
  - Honestly not a big deal
  - If a reviewer brings one to your attention, you can add it in
- “What if I found a paper that does exactly what we were planning to do?”
  - It’s highly unlikely that the paper actually does exactly what you proposed
  - There are typically caveats/restrictions to their work that you could address (may have to dig into the paper to find them)
  - Work with your teammates & mentors to find the novel aspects of your work
- “This is taking FOREVER….”
  - Yeah, it might feel that way, but it’s an important step
  - No this is not some research hazing exercise
  - I promise it gets better/easier/faster with practice
- Literature Review part of introduction turns into a list of “Bla et al. did bla bla bla [1].”
  - Group similar sources and describe the overall direction & important aspects of the research
  - Avoid repeating the common aspects. Mention them once and use paragraphs/subheadings to imply common elements
  - Be intentional about varying sentence structure

Making Your Life Easier

- Use a citation manager
  - EndNote, Zotero, etc.
  - Automatically:
    - Downloads citation information (sometimes this is a little finicky)
    - Formats citations in your desired style
    - Generates Bibliography in Word
    - Exports to BibTex (for LaTeX, again sometimes this is a little finicky)
  - Be careful about LANL information security/cloud services policies
- Set reasonable limits on how wide you cast your net for sources
  - What is still relevant? (Date)
  - Restrict yourself to more reputable publications when possible
- Start writing the introduction in the final paper template (less reformatting work later)

Live Demo!
To the Interwebs!